USE OF METHYL IODIDE FOR NEMATODE CONTROL

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The objectives of the studies reported herein were to evaluate use of methyl iodide (MI) as a preplant soil treatment for control of the southern root-knot nematode, _Meloidogyne incognita_, yellow nutsedge, _Cyperus esculentus_, and to measure resultant impacts on tomato yield. Although other alternative fumigants were simultaneously evaluated within these trials, only results from methyl iodide treatments are presented.

MATERIALS AND METHODS: During spring 1995, two experiments were conducted in buried field microplots (95 l) at the University of Florida Citrus Research and Education Center in Lake Alfred, FL. In experiment 1, treatments included methyl iodide broadcast application rates of 25, 50, 100, 200, and 300 lb/a compared with an untreated control. Before soil treatment, 5 yellow nutsedge tubers were planted one half inch deep in a pentagon pattern within each microplot. In experiment 2, treatments included methyl iodide broadcast application rates of 140 and 280 lb/a compared with an untreated control. Residual yellow nutsegde densities from a previous experiment were used to assess weed control efficacy. In both experiments, nutsedge germination was assessed at weekly intervals, after which, nutsedge plants were removed from each microplot.

Methyl iodide was soil injected to a depth of 8 inches using a Hamilton Gas Tight syringe installed with a 10 inch (25 cm) long stainless steel needle. For each microplot, three equidose soil injections were made in a triangular pattern, with each injection point separated from its neighbor by a distance of 10 inches. Following treatment, a black on white 1.25 mil polyethylene plastic mulch cover was installed over the microplot until planting. Nematode population densities in soil were assessed for both experiments before treatment, 5 weeks after treatment, and again after final harvest in experiment 1.

Five week old tomato transplants (cv. Sunny) were planted 23 March 1995. Water and nutrients were supplied to each microplot according to reccommeneded practices. Other pest and disease control measures were maintained primarily on an as needed basis. On 7 June 1995, tomato plants from each microplot were stripped of fruit, sorted into 6 different size categories and fruit from each size category counted and collectively weighed on a Mettler balance. Following harvest, these same plants were cut at the soil line and the foliage weighed. Immediately after foliage removal the plants were uprooted and the root systems evaluated for root gall severity based on a visual rating scale of zero to ten. Final soil population density samples were then removed after root gall assessment.

RESULTS: Tomato yields were significantly (P=0.05) increased by all but the lowest methyl iodide application rate (Table 1). Although no differences between methyl iodide treatments were observed, there was a significant (P=0.012) linear correlation between application rate and tomato yield response.

Pretreatment soil population densities of M. incognita were not significantly (P=0.05) different among treatments in either experiment, ranging from 266 to 1339 juveniles (J2) per 100 cc soil (Table 1). Although residual populations remained in some cases, all methyl iodide treatments significantly (P=0.05) reduced post treatment soil population densities of M. incognita in experiment 1. Soil population densities of M. incognita were reduced to undetectable levels in experiment 2, while a two fold increase in nematode density was observed within the untreated control (Table 2). No significant (P=0.05) dose response relationship between methyl iodide application rate and either post treatment or final harvest soil population density could be discerned. Use of methyl iodide did not significantly (P=0.05) reduced final harvest M. incognita soil populations compared to the untreated control.

Final harvest root gall severity was not significantly (P=0.05) reduced from the level of the untreated control by any methyl iodide treatment. Although no differences (P=0.05) were observed between methyl iodide treatments, a significant (P=0.059) linear dose response relationship was observed between application rate and root gall severity. Microplot germination of yellow nutsedge was significantly (P=0.05) reduced by all methyl iodide treatments in experiment 1 and 2. In experiment 1, methyl iodide broadcast application rates in excess of 50 lb per acre were required to eliminate nutsedge from microplots. In experiment 2, nutsedge germination was virtually eliminated at the 150 lb broadcast rate.

SUMMARY: The lack of a significant dose response suggests that methyl iodide broadcast rates as low 50 lbs per acre could provide acceptable nematode control and crop yield response. It would appear however, that soil population densities were at sufficiently high levels within all methyl iodide treatments at final harvest to preclude planting of a second crop without significant risk of crop injury. Based on the combined results of experiments 1 and 2, higher application rates, possibly as much as 100-150 lb/a, may be required to achieve satisfactory control of yellow nutsedge. Although not reported, field demonstration trials with minimal replication, failed to achieve significant reductions in nutsedge densities at broadcast equivalent application rates of 200 lb/a. Although promising in preliminary trials, methyl iodide pest control efficacy studies must be continued in both microplot and field settings to guarantee the accuracy and consistency of these results.

Table 1. EXPERIMENT 1: Effect of methyl iodide application rate on tomato yield, percent yellow nutsedge germination, root gall severity, and pre, post, and final harvest population densities of Meloidogyne incognita in field microplots during spring 1995.

TREAT MENT	PLOT RATE (ml)	TOMATO YIELD (g)	NUT SEDGE GERM. (%)	M. incognita per 100 cc soil			ROOT GALL
				PRE	MID	FINAL	
CHECK	---	1125.4 b	80.0	266a	21a	769a	7.3a
METHYL IODIDE	0.36	2350.0 ab	17.8	997a	0 b	175ab	5.3a
METHYL IODIDE	0.72	2658.6 a	2.2	1021a	1 b	205ab	5.6a
METHYL IODIDE	1.43	2460.5 a	0.0	678a	3 b	65b	4.5a
METHYL IODIDE	2.87	3125.1 a	0.0	822a	0 b	228ab	5.4a
METHYL IODIDE	4.29	2738.8 a	0.0	1339a	0 b	244ab	4.4a

Table 2. EXPERIMENT 2: Effect of methyl iodide application rate on yellow nutsedge densities, and pretreatment and post application population densities of Meloidogyne incognita in field microplots during spring 1995.

TREATMENT	PLOT RATE (ml)	NUTSEDGE DENSITY/ MICROPLOT	M. incognita per 100 cc soil	
			PRE	POST
CHECK	---	4.75 a	405 a	843 a
METHYL IODIDE	2.0	0.014 b	774 a	0 b
METHYL IODIDE	4.0	0.0 b	472 a	0 b